PLANT PATHOLOGY NOTE NO. 38

DISEASES OF CITRUS
PART 1: BACTERIAL AND FUNGAL DISEASES

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ABSTRACT

Bacterial and fungal diseases of citrus are abundantly increasing and many are not yet found in Papua New Guinea. Few economically important diseases are currently on the rise and have become too common in citrus orchards. Diseases commonly found here are discussed.

INTRODUCTION

Citrus contains many species and varieties belonging to the Rutaceae family. It is a crop that grows and thrives in almost any condition provided there is sufficient moisture and nutrient in the soil. Soils that are too dry cause poor plant growth and fruit quality and excessive moisture cause general foliage chlorosis (leaf yellowing). In either case death may result.

It is worth mentioning here that not all symptoms or abnormal signs that appear on citrus plants leading to death or loss in yield are caused by diseases. Notable symptoms that may be difficult to differentiate (able to see and tell symptom difference one from the other) are basically on the foliage including general foliage chlorosis, veinal and interveinal chlorosis, leaf twisting and curling either upwards or downwards and leaf mottling. Such symptoms may be related to either excess or deficiency in moisture and nutrients or diseases.

Discussed here are some of the more economically and common diseases found in PNG. Other undesirable alien diseases including economically and lesser important ones are contained in the checklist.

DISEASES OF CITRUS

There are several economically important diseases affecting citrus plants. In PNG three very common diseases are bacterial canker, pink disease and scab. In 1991 survey for virus diseases of citrus in PNG, 5 different virus diseases were detected and other diseases including 3 mentioned above were obviously present.

BACTERIAL CANKER

Bacterial canker is known to occur in almost all continents worldwide including Africa, Asia, Australasia and North and South America. It is a disease caused by bacterium *Xanthomons campestris* pv.*citri.* and attacks most commerical citrus varieties and many relatives. Among the commerical varieties susceptible to bacterial canker are grapefruit, trifoliate orange*, key lime sweet orange, lemon, Satsuma, mandarin, calamondia, citron and kumquat. The disease is common mainly in the tropics and semitemperate regions. High humidity in particular favours the spread and development of this disease.

SYMPTOMS

The distinctive and obvious feature of bacterial canker is the scab-like lesion (spot) that develops on fruits, leaves, twigs (branches) and roots. On fruits the canker first appears as a small, round, slightly raised spot which grows and develops into irregular, sunken, tan-coloured scab. On leaves, twigs, branches and roots lesion often appears as a small, raised, translucent spot, usually darker green in colour than the surrounding tissue. The epidermis (outer skin layer) over the spot on fully developed canker turns yellowish or whitish and raptures exposing the crater like line with tan-coloured spongy tissue. On leaves alone canker lesion often appears on both sides of the leaf. Individual lesions may coalesce to form scurfy patches. Infection on midribs and petioles may cause leaf drop or leaf to fall.

CONTROL

In areas where canker is not present strict quarantine measures against introduction should be mounted.

*Figure 1. **Bacterial canker on leaf. Notice the chlorosis or yellowing margins surrounding the necrotic or dead tissue of canker disease.***

resistant species and varieties may be grown. A measure partly effective in prevention is spraying with Bordeaux mixture having an excess of lime during the early first three months after fruit is formed. Infected trees areas should be immediately removed and burned.

PINK DISEASE

Pink disease is caused by a fungus, Phanerochaete salmonicolor (Syn. *Corticium salmonicolor).* It attacks many woody plants and among these are some of the very economically important crops such as citrus, tea, coffee, cocoa and rubber. It is present in Africa, Asia, Australasia and South America but more common in the eastern hemisphere. Plant parts mainly affected are the twigs and limbs (trunks) and affected trees are often killed by its girdling effect. The pink disease affects all citrus species and relatives.

SYMPTOMS

Infection often starts in sap pockets on either the trunks or twigs and the first symptoms are the drying, hardening and cracking of the bark and secretion of gum. Following this, the affected area is then covered with a thin mass of pinkish orange fungal mycelium with a white advancing margin that spreads over the outside of the bark. This may only be visible during rainy season. During dry weather and with age the velvety surface of affected area cracks and a dirty white hard coating over the bark. The fungus then enters the bark and sometimes the wood and affects the conducting tissues. The tissues become brown in colour and both water and nutrient up-take ceases, resulting in girdling effect. This is characterised by the rapid yellowing and drying of leaves, which eventually leads to die-back condition.

CONTROL

Affected twigs, branches and trunks should be removed by pruning and burned. Pruning should be done well below or away from sites of obvious infection. Disinfect the pruned parts immediately by spraying with copper fungicide or lime-sulfur mixture. For effective control spraying should be done before and during the rainy season. Ensure all individual trees or the orchard be kept clean from source of infections.

SCAB

Scab disease is caused by a fungal pathogen called Elsinoe fawcettii. It is quite common in some parts of PNG and attacks almost all parts of citrus plant including leaf, fruit, twig and small limbs. Citrus

Figure 2. **Bacterial canker on twig of citrus plant.**

Figure 3. **Pink disease affecting the stem of citrus plant. Notice the white to pinkish colour of the fungus growing over the affected stem surface.**

Figure 4. **Scab disease on leaf and twig of citrus. Notice that marginal chlorosis surrounding the scab spot is absent while stenation (curling and twisting) of leaf is a typical symptom of this disease.**

species that are susceptible to scab disease are sour orange, lemon, tangelo, grapefruit and mandarin varieties.

SYMPTOMS

The disease first appears as small translucent (clear) lesions or spots. These spots are raised above surface levels and are variously coloured, mainly dull yellow, but at times colours such as red, orange, or bright yellow may be seen. Well developed spots are often olive-drab or dull, yellowish brown in colour with a welldefined warts or scab on the surface of infected part. On fruits the scab may consist of either corky projections (tough solid substance protruding onto surfaces) or irregular raised pastules without distortion as a grapefruit. Lesions on leaves are mainly semitranslucent (slightly clear) dots with well defined margins and with either flat or depressed at the centre of the spots. The leaves become crinkled, distorted and stunted while the fruits become deformed. Fruits with such features are often not marketable due to their ugly and unsightly appearances. On young and succulent twigs lesions are of the same features as those on leaves.

Checklist of some economically important Bacterial and Fungal Diseases of Citrus (diseases marked with an asterisk (*) have been recorded in PNG)

DISEASES	CAUSAL AGENT	ATTACKS	SPREAD BY
BACTERIAL DISEASES			
* Canker	*Xanthomonas citri*	Leaves, twigs, roots, fruits	Water splash, infected nursery stock, contaminated body parts and equipment.
Blast and black	*Pseudomonas syringe*	Leaves,twigs,fruits,	Infected buds and rootstock injuries pit to plant parts.
FUNGAL DISEASES			
* Foot rot	*Phythophthora parasitica*	Trunks	Rains splash, wind, insect, soil
* Melanose	*Diaporthe citri*	Twigs,leaves, fruits	Rain, wind, contact with diseased plant parts.
Black spot	*Homa citricarpa*	Fruits, leaves, twigs	Rain, wind, contact with diseased plant parts.
* Scab	*Elsinoe fawcettii*	Leaves, fruits, twigs	Wind, insect, dew, rain.
* Anthracnose	*Colletotrichum gloeosporiodes*	leaves, twigs, Fruits	Rain, dew, contact with diseased plants parts.
* Pink disease	*Corticium salmonicolor*	Trunks, branches	Rain, insect
* Blue mould	*Penicillium italicum*	Fruits	Contact with diseased fruits
* Green mould	*Penicillium digitatum*	Fruits	Contact with diseased fruits
* Bark rot	*Diplodia natalensis*	Trunks	Rain splash
Seedling blight	*Phythophthora palmivora*	Young seedlings, young growing shoots	Rain, wind
Gummosis	*Diplodia natalensis* *Fusarium. sp.* *Phythophthora sp.*	Trunks, stems, fruits	Rain, winds.
* Damping-off	*Rhizoctonia solani* *Sclerotium rolfsii* *Fusarium sp.*	Seedling, young growing shoots	Poor management water splash, contaminated soil
* Dry root rot	*Fusarium sp.,*	Roots	Overwatering, injuries to roots by heavy application of fetilizer and herbicides or mechanical injuries.
Fomes root rot	*Fomes lamavensis*	Roots	trunks overwatering, contact with infected parts.
* Collar and root rot.	*Phelinus noxius*	Trunks, roots	As Fomes root rot.
Armillaria root rot.	*Armillaria mellea*	Trunks, roots	Root contact, infected soil.
* Leaf spots	*Colletotrichum* *Gloeosporoiodes* *Ascochyta citri* *Glomerella cingulata* *Phomopsis sp.* *Phoma tracheiphila*	Leaves	Rain splash, wind,dew, contact with diseased parts.
* Twig die back	*Dothiorella sp.* *Diplodia sp.* *Tryblidiella rufula*	Twigs	Rain, contact with infected parts.
* Stem blight	*Rhizoctonia sp.*	Stem	Rain, contact with infected parts.

are of the same features as those on leaves.

CONTROL

Control and prevention of scab in orchards may consist of spraying with Bordeaux or Bordeaux-oil emulsion or Copper oxychloride. Spraying should be just before growth starts and when at least all of the blossoms have fallen. Severe infection spraying may be applied at pre-bloom and after petal fall. Always follow manufacture's dosage. In nursery stock plants can be prevented by frequent spraying Bordeaux mixture. Reducing light intensity through increasing shading in the nursery also protects plants from infection.

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(The following correction on p. 19 was pointed out to us too late to be corrected. "under fig 4 Stenation should read enation" - Editor)